



Collapse and diverse responses in the Gulf lowlands, Mexico

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ABSTRACT

Between AD 800–1000, the south-central and southern Veracruz lowlands experienced a process of collapse with depopulation that we document with data from systematic archaeological surveys and paleoenvironmental studies. The subsequent record in the Postclassic period indicates varied responses, predominantly settlement reorganization involving retrenchment to fewer settlements or highland immigration. In the latter case, we argue that collapse with depopulation has an important link to migration, providing lightly occupied or vacant lands that afford opportunities for outside migrants. The Spanish conquest and ensuing Colonial period serve as a general comparative analogy for some processes we discuss in prehispanic times for the Gulf lowlands. Unlike the Colonial period, the causes of the prehispanic Gulf collapse are not well studied, but multiple factors likely contributed. Drought and socioeconomic domino effects could explain the extensive spatial scale of collapse that we document. The dramatic, complex collapse in the southern Maya lowlands during a similar interval has dominated Mesoamerican discussions of collapse, but a wider spatial perspective indicates not only a more extensive interregional phenomenon, but also a greater diversity of responses.

1. Introduction

We argue for collapse during A. D. 800–1000 over an extensive part of the Gulf lowlands of Mesoamerica, followed by reorganization or outside immigration.¹ We establish that collapse with depopulation can create opportunities for later immigrants to obtain lands and establish settlements. Evidence for collapse derives from systematic surveys that show broad-scale changes as striking and complex as coeval processes in the southern Maya lowlands. In south-central and southern Veracruz, Mexico (Fig. 1), existing polities and cultural traditions largely ceased near the end of the Late Classic period (AD 800–900) or early in the subsequent Postclassic period (AD 900–1000). Regions that reorganized with fewer, more nucleated settlements contrast with other areas that remained largely vacant. In yet another outcome, some regions were lightly re-populated by migrants from the adjacent Mesoamerican highlands during the Postclassic period (AD 900–1521) or highland immigrants joined remaining local settlements. These migrations led to cultural heterogeneity, evidenced by multiple languages and cultural diversity at some Postclassic Gulf centers.

We first clarify the key concepts of collapse and migration because of their varied meanings. We draw insights from Spanish colonial studies to provide the richness of a documentary example to illustrate both variety and consistencies in collapse processes and subsequent responses, such as migration—in the vein of a general comparative

analogy (Willey, 1953; see also Lyman and O'Brien, 2001). Colonial documentary studies also address marked native population loss, particularly in lowland regions, such as the ones we study. Although some native populations continued under Spanish rule, sociopolitical disruption and introduction of new colonial cultures make the Spanish case appropriate as a general comparative analogy for the processes we address, rather than a specific historical one. Colonial period disruptions from conquest and epidemics led to the demise of many pre-existing polities and profound political reorganization resulting in vacant or greatly depopulated lands. The colonial situation created opportunities that migrants exploited, leading to culturally heterogeneous regions and settlements—analogs to earlier patterns we discuss and enlarging the range of examples of the processes of interest.

Next, we summarize archaeological and paleoenvironmental information concerning Gulf collapse and related Postclassic responses. A brief comparison to collapse on the Pacific coast of Chiapas and Guatemala indicates an even larger spatial scale in the coastal lowlands. The range of responses to Gulf collapse augments the picture from the southern Maya lowlands by including evidence of highland migrants to the Gulf area. In our concluding discussion we note that the sheer scale of collapse points to spatially extensive causal processes, the two most prominent being climate change and cascading socioeconomic disruptions.

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¹ In some parts of Mesoamerica, investigators label the A.D. 800–1000 interval the Terminal Classic or Epiclassic period, but we primarily use phase names or calendar intervals.

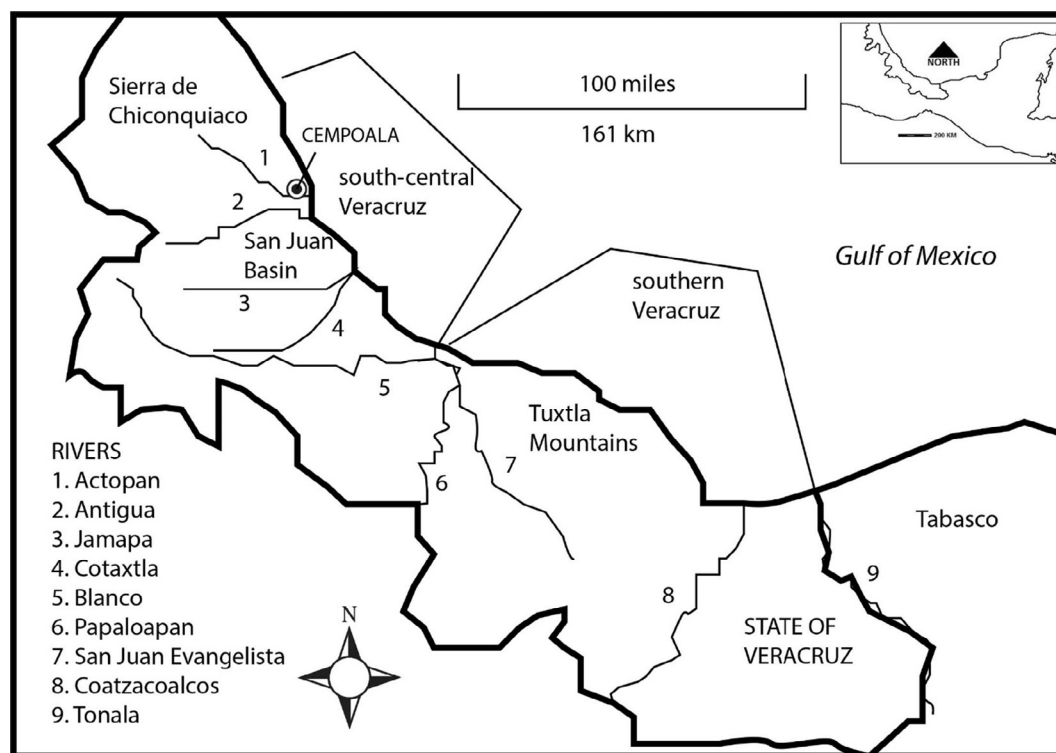


Fig. 1. Regional divisions and major rivers of the Gulf lowlands discussed in the text.

2. Key concepts

2.1. Collapse

Scholars have disentangled many contributing threads of political, economic, and cultural decline, frequently observing that collapse is not as final as it sounds because societies reorganize in various ways (McAnany and Yoffee, 2010; Renfrew, 1979:482–485; Schwartz and Nichols, 2006; Yoffee and Cowgill, 1988); reorganization has provoked an interest in resilience theory (Alexander, 2012; Chase and Scarborough, 2014; Faulseit, 2015; Iannone, 2014b). Typically, authors note a spectrum problem: the rates, extent, and diversity of changes do not handily distinguish collapse from decline (Diamond, 2005:3; Schwartz, 2006:5–8; Tainter, 1988:4).

One response is to address a polythetic set of changes for collapse (Schwartz, 2006:5–6, Tainter, 1988:4). In a formulation similar to Renfrew's (1979:482–483), Schwartz (2006:3–6) notes that, for archaeology, collapse usually entails some or all of four traits: (1) fragmentation of states into smaller political entities; (2) partial abandonment or complete desertion of urban centers, along with the loss or depletion of their centralizing functions; (3) breakdown of regional economic systems; and (4) failure of civilizational ideologies. Diamond (2005:3) includes marked population reduction or disappearance for an extended time in a region. We add depopulation to the polythetic set proposed by Schwartz because it signals some of the most dramatic collapse cases and implies vacant lands open to subsequent migration and repopulation.

In Mesoamerica it is safer to think in terms of marked population decline when depopulation is discussed, rather than complete abandonment, because Mesoamerican archaeologists have problems detecting very light occupations. In some parts of the southern Maya lowlands, for example, evidence for a greatly reduced and reorganized population corrects impressions of complete abandonment (Iannone, 2014a:42–43; Rice and Rice, 1990; Schwarz, 2009). Turner's (1990:310) demographic modeling for the central lowlands suggests an overall decline of 53–65 percent, although his calculations did not

address “invisible” housemounds (Johnston, 2002, 2004).

Collapse studies face the challenge of commensurate scales (McNeil, 2010). Cowgill (1988:256) urged researchers to identify clearly what has collapsed (e.g., a state, a civilization). We address a large spatial scale with multiple Gulf regions and polities that share aspects of distinctive architectural layouts, portable material culture (e.g., pottery and figurine styles), and ritual practices (e.g., concerning the ball game), although with much interregional variation (Daneels, 2006a, 2012; Ladrón de Guevara, 2012; B. Stark, 1998, 2016). In regard to its extensive spatial scale, multiple polities, and variable timing, Gulf collapse resembles changes in the southern Maya lowlands during the Terminal Classic period (AD 750–1050) (Aimers, 2007; Demarest et al., 2004; Ebert et al., 2014; Webster, 2002).²

In south-central Veracruz, Postclassic settlements indicate highland immigration, but southern Veracruz predominantly shows settlement reorganization. Population movements occasioned by collapse are discussed for some locales in the southern Maya lowlands (e.g., Johnston et al., 2001; Rice and Rice, 1990), but migration from outside areas is uncommon. In the Department of El Petén, Guatemala, substantial repopulation by migrants did not occur until relatively recently, accelerating after 1960 (Atran et al., 2002:422–423; Sader et al., 1994).

Colonial responses by both European and native groups lend insights into depopulation, reorganization, and migration. Estimates of native population loss due to introduced diseases are high, particularly for the lowlands (Siemens, 1998:107; Sluyter, 2002: 148–161; see also Cook and Borah, 1960; Cook and Simpson, 1948). In south-central Veracruz, the earliest report of an epidemic dates to the 1520s (smallpox). Cycles of epidemics occurred almost every decade, climaxing with the Great Cocolixtle (a widespread epidemic of uncertain cause) in the late 1570s (Sluyter, 2002:154). By 1580, Sluyter

² Scholars have addressed other collapses—or the equivalent labeled “releases” in adaptive cycling—during different periods for the Maya region (Alexander 2012; Iannone, 2014a) and in Early Classic southern Veracruz (Lunagómez Reyes, 2011; Symonds et al., 2002), but these other instances differ in scale from the collapse we address.

(2002:154) estimates that the population may have been reduced by 98 percent or more around some Veracruz settlements.³

One possible outcome of an extreme population reduction is settlement reorganization. Reorganization implies the appearance of new settlements or noteworthy changes in the layout or buildings of existing settlements. In comparison, the fragmentation of states into smaller entities, one of the polythetic traits of collapse, could involve considerable settlement continuity, particularly at lower-order places.

Reorganization is evident in the colonial period. Between epidemics Spanish officials consolidated surviving native populations into new and existing settlements through programs of *congregación*, mainly between AD 1550–1563 and 1593–1605 (Cole, 2003:79–80; Sluyter, 2002:156–158). Reorganization often involved changes in settlement layout to incorporate a grid system and other aspects of Spanish colonial town planning (Cole, 2003:82). Following rather drastic depopulation during the prehispanic collapse, we document processes of settlement reorganization in southern Veracruz. South-central Veracruz, however, is predominately characterized by highland immigration that contributed to heterogeneous settlements or the founding of new settlements.

2.2. Migration

We use population movement as a broad term (contra Rouse, 1986:176–177 but similar to “demographic re-accommodations” [Manzanilla, 2005]). In our view migration is more specific, a relocation that involves multiple people or families and multi-year or permanent residence in a different and distant place, not a move within the original settlement, region, or social context; ours is a common usage for archaeology (Tsuda, 2011:320–323). Migrants may return to their origin area, but in our definition they reside elsewhere for an extended interval.⁴ Some prehispanic migrations to the Gulf lowlands may have involved immigration to pre-existing polities, and possibly refugees from unrest elsewhere. Land seizures may have occurred if conflicts preceded immigration but also if prior collapse and depopulation provided opportunities to occupy lands.

The maneuvers of expanding states and empires, political unrest, as well as decision-making at a variety of lower levels – such as communities, families, or individuals – imply a broad range of possible contexts leading to migration, influenced by a variety of practical considerations such as distance, information, degree of danger, and resources for movement. The Gulf lowlands are described by Smith and Berdan (2003:27) as an “affluent production zone,” and, after depopulation, largely vacant but potentially productive agricultural lands constituted a “pull” factor (Anthony, 1990:899).

The Spanish Colonial period displays processes that were similar to the aftermath of AD 800–1000 regional collapses in south-central and southern Veracruz. The forced resettlement of declining native populations created vacant or underpopulated lands. Spanish immigrants took advantage of the opportunity to obtain Gulf land grants for livestock, sugar cane, and farming (Carroll, 1991:11; Chevalier, 1963:74–76; Siemens, 1998:142). Colonial depopulation also permitted some indigenous migrations (see Wilkerson, 1994:181 concerning sierra Totonic movements into Veracruz). In an earlier parallel process, Postclassic immigrants took advantage of vacant or else drastically depopulated lands that became available following the collapse of Late Classic Gulf states.

³ Sluyter (2002:148–161) examines sixteenth century population decline for south-central Veracruz using methods similar to Cook and Borah (1970–1974) and data drawn from published tax assessments, ecclesiastical reports, anecdotal accounts of travelers, and other sixteenth century documents. Given the many difficulties with reconstructing Colonial period populations, Sluyter (2002:153) suggests a margin of error of plus or minus 50 percent. Although potential for errors in absolute values is high, relative changes and trends are reliable.

⁴ Tilly's (1978:51–55, 67) “career migration” for work is a similar concept, but we also include groups larger than individual families.

Migration often leads to heterogeneity in settlements and regions. Spanish colonial officials tried to compel or attract native people to mining towns (e.g., Velasco Murillo, 2016:35–38), agricultural zones (e.g., Carroll, 1991:41, 62; Gibson, 1964:249), and borderland presidios (e.g., Dysart, 1998) in order to fill labor requirements. In other cases, valued resources combined with depopulation attracted both Spanish merchants and native immigrants, such as to the cacao-producing Soconusco region (Gasco, 2005:99–106). Resulting cultural heterogeneity was reflected in material culture (e.g., Card, 2013) and the *casta* system that developed by the seventeenth century (e.g., Cope, 1994:3; Frederick, 2011; Mörner, 1967). Recent genetic research on Mexican mestizo populations supports historical data on biological mixing—largely between European men and native women (Martínez-Cortés et al., 2012; Martínez-Cortés et al., 2013). We discuss heterogeneous prehispanic Gulf settlements that resulted from varied migrations, most apparently undertaken without state oversight.

Detection of migration archaeologically cannot rely on a thorough or exact replication of homeland culture (Anthony, 1990; Beekman and Christensen, 2003; Burmeister, 2000; Rouse, 1986:175–180). Social relations may be renegotiated rather rapidly, and new or modified material culture may emerge or local material culture may be adopted, as seen in the Colonial period. Earlier notions of migration did not accommodate the possibility of rapid change (e.g., Rouse, 1958:65).

In imperial colonies, segments of societies relocate, often with a reduced representation of the diversity of homeland culture along with innovation and change (Burmeister, 2000:543; Foster, 1960:10–12, 14). Among Spanish colonies, dependence on local or imported sources of labor led to indigenous, imported, or hybrid practices and material items in colonial households (e.g., Card, 2013; Smith, 1995; Voss, 2008b). Colonists may have adapted more to indigenous society than the reverse (e.g., Charlton et al., 2005; Deagan, 2003:8; Lycett, 2005), making it difficult to recognize a colonial presence archaeologically. Geographic and social dislocation accompanying movement may constitute opportunities for redefinition of class, status, or ethnic affiliation (e.g., Boyer, 1997; Castleman, 2001). Participation in the colonial military or acquisition of certain artisan skills allowed upward economic and social mobility (Seed, 1982; Vinson and Restall, 2005; see also Sinopoli, 1994:166–167). During the Postclassic period, elaboration of status-related serving vessels that were similar to highland styles suggests analogous practices following migrations into the Gulf lowlands.

Spanish colonists sometimes emphasized new identities, rather than use of homeland ethnic or other social categories (e.g., Voss, 2008a:292–293). Veracruz prehispanic migrants who had market access to goods may not have maintained a persistent allegiance to a broad emblematic suite of material culture. Selected markers of ethnic affiliation may have been few or perishable. Stark and Chance (2008) argue that self-ascribed ethnic identities in Mesoamerica were not primarily in terms of languages and tended to favor place of origin (contra Wilkerson, 1994:179 who assumes linguistic and ethnic correlation).

These preliminary remarks are a warrant for exercising great caution in the effort to integrate linguistic, ethnohistorical, and archaeological data about migration (Rouse, 1986; concerning a Oaxaca example, see Feinman and Nicholas, 2016; Marcus and Flannery, 1983). The most reliable archaeological assessments of social and cultural divisions—largely for the future—will go beyond overt pottery types, which have played an important role to date, and will pay close attention to technological styles that are resistant to rapid change (e.g., Pomedio, 2015; see also Clark, 2001; Gosselain, 2000; Hegmon, 1992; Lemonnier, 1993; M.T. Stark, 1998), as well as take into account both emulation and exchanges, such as gifts and market transactions (e.g., Ossa, 2011). We consider archeological, linguistic, and ethnohistorical evidence for prehispanic Gulf migrations in a later section concerning post-collapse responses. First, we summarize indications of collapse.

Table 1
Systematic surveys in south-central and southern Veracruz and in Western Tabasco.

| Region | Project or location | Percent decline in sites, Classic to Postclassic (centers, sites, components, or features) | Survey methods | Survey area, sq km | Sources |
|-----------------------------------|---|--|--|----------------------------------|---|
| Lower Antigua and San Juan Rivers | NACAR 3D | 23 Middle to Late Postclassic sites versus 348 Classic sites, 93% | Assess seismic lines with 550 m separation and signal receptor lines 50 m away, over 700 sq km. Sites subsequently mapped. | 700 (entire study area of 1085) | Heredia Barrera, (2007a, 2007b) |
| Lower Cotaxtla River | Lower Cotaxtla | 33 Postclassic sites, 123 Classic sites, 73% | 1115 km ² extensive (transects 400 m separation), 474 km ² reexamined semi-intensive that added 102 km ² (20–75 m separation of transects, radial or concentric from centers previously recorded), 13.5 resurveyed intensive (20 m separation of transects, noting sherd densities) | 1217 (218 overlap with NACAR 3D) | Daneels (2016):137, 142, (1997):244–245 |
| Western Lower Papaloapan Basin | Proyecto Arqueológico La Mixtequilla 1 and 2 | 2 Middle to Late Postclassic versus 37 Classic monumental complexes, 95% | Intensive, 20 m spacing of transect lines, including sherd counting to locate artifact clusters in addition to mounds; also 42 km ² reconnaissance with aerial photographs and pedestrian and vehicle examination | 99 (plus 42 recon.) | Stark (2006, 2008a, b) |
| Western Tuxtla Mountains | Catemaco Valley | 4 or 21 Postclassic sites, versus 99 Late Classic, 79–96% | Crew spacing 40 m | 400 | Santley and Arnold (1996), Venter (2008:42) Mullen (2017) |
| | Recorrido Regional Arqueológico Tres Zapotes, Paleodunas | 2 Postclassic versus 31 Late Classic, 94% (Postclassic features each represented by 1 piece of obsidian) | 50 m crew spacing, pedestrian survey | 20 | |
| | Recorrido Arqueológico El Mesón | 29 Postclassic versus 154 Late Classic features, 81% | Crew spacing 20 m | 27 | Loughlin (2012:83, 236–258) |
| | Recorrido Regional Arqueológico Tres Zapotes | Analysis of 2/3 of ceramic collections to date, 414 Late Classic features versus 117 Postclassic, 72% data include Recorrido Arqueológico El Mesón | More intensive: 62 km ² non-overlapping LIDAR, 175 km ² pedestrian survey with 50 m interval and some LIDAR; less intensive: 146 km ² low resolution LIDAR, satellite, and informants to record sites with multiple mounds plus one mound 5 m or more high (i.e., above level of village) | 383 | Pool et al. (2017), Christopher Pool pers. comm. (2017) |
| | Tepango Valley | 43 Postclassic versus 89 Late Classic (Chaneque phase) sites, 52% | Crew spacing 50 m, shovel test in 50 m intervals in pasture | 120 | Stoner (2011:175, 357, 367) |
| San Juan Evangelista River | Hueyapan | 4 Postclassic versus approx. 312 Classic sites (based on counting dots on maps), 98% No Postclassic sites detected | Crew spacing 10–20 m | 178 | Killion and Urcid (2001:4–7, 11, 14) |
| | San Lorenzo Tenochtitlan-Laguna de Juan survey | No Postclassic sites detected | Crew spacing 40–50 m | 320 | Borstein (2001) |
| Coatzacoalcos River | Reconocimiento Regional de San Lorenzo | No Postclassic sites detected | Crew spacing 20–30 m | 400 | Symonds et al. (2002:36, 134) |
| Western lower Grijalva River | Pajonal project; Lower Grijalva, especially Pajonal and Arenal distributaries | No or slight decline in general Grijalva sites integrating Sisson's study, but within systematic survey, Postclassic Early and Late Cindla, 10 and 9 sites respectively, versus Classic Arenal sites, 31; approximately 60% (distributary shifts affect site counts throughout sequence) | Use of aerial photographs, topographic maps; walking levee crests, transects off-levee with 125–250 m spacing, but 50–100 m spacing if surface visibility excellent | 189 | von Nagy (2003: 1043, 1055, 1057), Sisson (1976) |

Note: Cerro El Vigía survey (Kruszczynski, 2001) is not included because of uncertainty about recognition of Postclassic ceramics, e.g., at San Marcos.

3. Gulf lowland collapse

The exact timing of prehispanic settlement and cultural disruption is not well defined; important changes likely initiated AD 800–900 in some regions or were delayed until around AD 1000 in others. Several of the polythetic set of collapse indicators enumerated by Schwartz (2006) are present. For the first two traits, the fragmentation of Classic period states and desertion of centers are striking in a set of systematic archaeological surveys (Table 1; Stark and Eschbach, 2017). We cannot yet evaluate adequately Schwartz's third indicator involving a breakdown in regional economic systems, but prior obsidian importation patterns were replaced with new ones. In south-central Veracruz and the Tuxtla Mountains a high degree of reliance on Zaragoza-Oyameles obsidian gave way to an emphasis on Pico de Orizaba and Pachuca green obsidian (e.g., Daneels and Miranda Flores, 1999; Stark et al., 1992; Stark, 2008a; Venter, 2008:449–460; compare Santley et al., 2001:57 with Arnold and Venter, 2004:12).

More excavations are needed to assess the failure of “civilizational ideologies,” Schwartz's fourth trait, but certainly the arrangements of public ritual buildings were not the same during the Postclassic period as earlier. In the Late Classic period (AD 600–900), characteristic plaza plans were repeated: the Standard Plan in south-central Veracruz (Daneels, 1997; Stark, 2016) and the cognate Long Plaza Plan in southern Veracruz (Heredia Barrera, 2007a; Killion and Urcid, 2001:11) (associated with the Villa Alta phase and also called Villa Alta Quadrupartite Plan [Borstein, 2001:37; Lunagómez Reyes, 2011] and Tipo A [Symonds et al., 2002:110]). We have no secure indication that these architectural layouts continued into the Postclassic period past ca. AD 1000.⁵ As yet, no post-collapse centers in south-central or southern Veracruz have been detected with a ball court, previously a major cultural institution. High-value Classic ballgame ritual gear—carved stone yokes, palmas, and hachas—are not part of Postclassic Gulf cultures.

Postclassic settlements in south-central Veracruz have reduced investment in monumental construction compared to the Late Classic period, and some have elongated low mounds around plazas (Daneels, 2012:360–361). Daneels (2002:361) notes for the Cotaxtla drainage that Postclassic sites tended to locate along major water courses, and many are relatively nucleated, also evident in the western lower Papaloapan Basin. In many respects, collapse is most evident in political, elite, and elaborate ritual spheres of public life.

Finally, Diamond's (2005:3) additional indicator of collapse—depopulation—is marked in both south-central and southern Veracruz, as documented in regional surveys (Table 1). The Postclassic arrival of immigrants in south-central Veracruz with new cultural patterns connected to the Mexican central highlands is not chronologically precise, but occurred at least by AD 1200. Some of these intrusive groups may have contributed to the disruption of the Classic tradition, but the decline and abandonment of many of the Classic centers likely occurred well before.

⁵ Berlin (1960:Fig. 2) shows a plan for Juárez, Tabasco, that is similar to the Long Plaza plan, but the site yielded materials from two sequential cultural complexes. Juárez produced a Jonuta horizon trash dump (comparable in time to the Arenal and Villa Alta phases), but Berlin (1960:135) only addressed the later Postclassic Cintla horizon materials. Berlin's (1960:108–109) excavations do not rule out Cintla phase use or reuse of an earlier complex. One excavation was on top of the principle mound, where sherds (presumably Cintla) were concentrated in the top 20 cm of topsoil, especially toward the back of the structure. The elongated mounds flanking the long plaza each had a small pyramid at the end, atypical of the Long Plaza plan. One pyramid was trenched at its base, and the fill mostly lacked sherds to a depth of 4 m. A pit in the plaza area in front of the same structure encountered fill with few sherds. Thus the excavation data do not resolve whether the site layout dates from Arenal times, overlapping Villa Alta, or if the Long Plaza layout was constructed as late as the Cintla phase.

3.1. Archaeological data

Our focal areas are south-central and southern Veracruz. We use the Sierra de Chiconquiaco to separate north-central from south-central Veracruz. North-central Veracruz lacks enough published surveys for us to evaluate collapse in that northwest direction. The Papaloapan River is the traditional but arbitrary dividing line between south-central and southern Veracruz (Fig. 1). We consider the western and nearby eastern lower Papaloapan Basin together because of their related archaeological records. In southern Veracruz we address the Tuxtla Mountains and riverine areas. The Gulf lowlands extend eastward into Tabasco. At present, data for Tabasco may indicate a limit to the collapse process, possibly an area with disruptions rather than collapse.

Table 1 draws on settlement pattern data from systematic surveys that are sufficiently well-published to indicate whether there was dramatic depopulation or settlement reorganization (Fig. 2). The surveys vary in intensity and site definitions, but all are geared to record centers reliably. In each instance, our emphasis is on comparison of site counts between major periods so that individual surveys are internally consistent. Table 1 compares systematic site (or monumental complex or feature) counts for the Classic and Postclassic periods and gives the percent of decrease, ranging from 72 to 100 percent.⁶

3.2. Paleoenvironmental data

Although paleoenvironmental studies in the Gulf lowlands are few, they contribute important information. The data pertain to two regions (San Juan Basin and the Tuxtla Mountains), revealing continuity or discontinuity in agriculture. Archaeological and paleoenvironmental data from the San Juan Basin are somewhat contradictory, however. Casimir de Brizuela (1995) reports no Postclassic occupation along the San Juan River in a 40 km² survey area, and Daneels (2012:463) suggests this area was abandoned. A core from the San Juan wetlands supports that conclusion with maize pollen and phosphorus indicating little prehispanic occupation after about AD 550 (Sluyter, 1997). More recent analyses provide different information.⁷

Sluyter and Domínguez's (2006) subsequent pollen profile includes weedy and arboreal taxa that have wider air-borne distributions than maize and reflect conditions on the coastal plain between the coastal dunes and piedmont (Sluyter and Domínguez, 2006). The Classic and Postclassic periods lack radiocarbon dates within the core to discriminate their time spans, but no striking changes in disturbance are evident leading to historical conditions, i.e., continuing agricultural activities. These paleoenvironmental data in combination with the continuity of some traditional fine paste Gulf pottery at some sites, such as Postclassic Cempoala and in Heredia Barrera's (2007b) survey, do not suggest complete depopulation. Some locations, such as the area surveyed by Casimir de Brizuela (1995) near raised field complexes, may have lacked Postclassic sites, but other locations had some continuity of populations.

The Tuxtla Mountains are the Gulf region with the most

⁶ Systematic survey of 110 km² on the east coast of the Tuxtla Mountains revealed abundant Late Classic occupation, but Postclassic traces have not yet been recognized in survey or excavation (Becerra Álvarez and Budar, 2017; Budar, 2016). The survey is likely to add another instance of nearly 100 percent decline when final results are available.

⁷ Maize is not widely distributed by wind, but John Jacobs (personal communication 2016) comments that it is buoyant and can be transported by water. In the first Laguna Catarina core, a maize cultivation period from 2400 BC to AD 550 is followed by a hiatus until AD 1100–1200, followed by another interruption of maize evidence until AD 1750. The hiatus starting at approximately AD 550 Sluyter (1997:141–142) attributes to slope destabilization in the piedmont and possibly eutrophication. Phosphorus values also plummet after AD 550, suggesting less human activity in the vicinity. Except for one Postclassic episode, the core points to an absence of subsequent farming. Because the subsequent pollen analyses include weedy taxa and trees (Sluyter and Domínguez, 2006), we consider them a more reliable monitor of wider agricultural activity, with no interruption indicated.

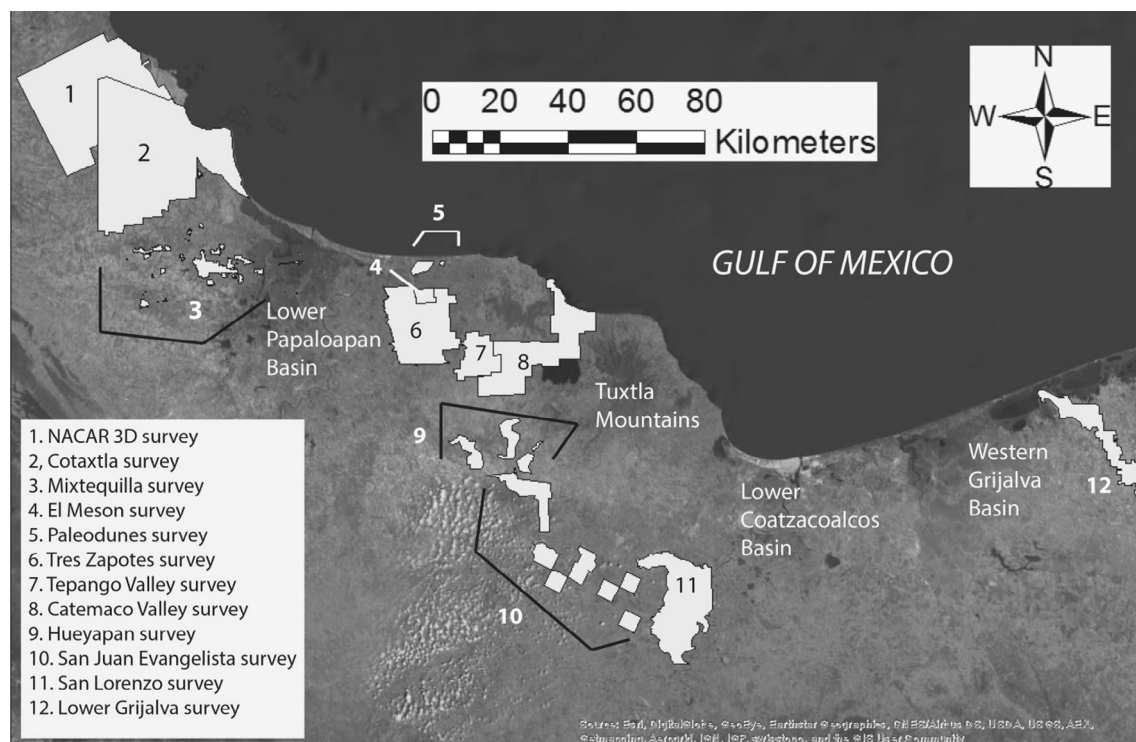


Fig. 2. Map of Veracruz indicating the location of settlement surveys.

paleoenvironmental information, and it accords with archaeological findings concerning collapse. Three lake cores produced pollen and other environmental information: Lake Verde 100 masl on the north-western slope of the San Martín volcano (Lozano-García et al., 2007; Lozano-García et al., 2010); Lake Catemaco in the approximate center of the Tuxtla Mountains, 340 masl (Byrne and Horn, 1989); and Lake Pompal, located 700 m asl east of Catemaco on the western slope of Santa Marta volcano (Goman and Byrne, 1998). Despite initial problems dating the Catemaco core, later cores show that all three locations display a marked Postclassic drop in weeds associated with agriculture and a boost in tree pollen indicating forest regrowth. The decline in farming began near the end of the Classic period at Lake Verde (ca. AD 800) and endured through the Postclassic period, in accord with archaeological indications of substantial depopulation during the Postclassic period. Lake Verde profiles wetter conditions post AD 800, not drier ones, a point to which we return in a discussion of drought as one possible cause of collapse.

3.3. Coastal lowland collapse in a broader frame

Although our focus is collapse in the Gulf lowlands and changes that ensued, the scale of coastal lowland collapse is larger than the Gulf lowlands. Two surveys on the Pacific coast of Chiapas and Guatemala (historically, the Soconusco region) point to collapse and change on a wider scale.

Pacific coastal Chiapas researchers have backed away from Coe and Flannery's (1967:97, 99) idea of near abandonment during the Postclassic period. Nevertheless, a substantial population reduction and reorganization characterizes the western Soconusco. Voorhies et al. (2011:53, 75, 123) recorded 80 Early Classic sites, 66 Late Classic sites, and 32 Late Postclassic sites (only 13 of the last with substantial occupations), with the Early Postclassic as a gap. The Late Postclassic constitutes a 52 percent reduction in site count from the Late Classic period.

Perhaps archaeologists see an Early Postclassic gap because they do not adequately recognize diagnostic ceramics (Voorhies and Gasco,

2004:10–11). In the western Soconusco the other consideration is a change in the visibility of sites, with less Postclassic construction of platform mounds for residential and other buildings (Voorhies and Gasco, 2004:12–13). Most of the small late Soconusco sites are along the coastal estuary system, a striking aspect of settlement reorganization. Although researchers have few diagnostics for the Early Postclassic period to help date sites, that period likely had an even more marked dip in population than the Late Postclassic period.

On the Pacific coast of Guatemala, archaeological evidence suggests Early Postclassic depopulation in the Escuintla area, which in turn implies a collapse of Late Classic centers (Bove et al., 2012). Bove (2002) and Bove et al. (2012) describe Late Postclassic settlement changes in the arrangements of buildings and architecture, usually with shallow, new occupations.

These two Pacific coastal surveys are provocative, suggesting changes paralleling the Gulf lowlands. We have considerably more documentation for a Gulf collapse, however, because of the greater number of surveys. South-central and southern Veracruz augment the area of the AD 800–1000 collapse process documented in the southern Maya lowlands by about 18 percent (using most of the Gulf terrain below 100 m elevation, plus the Tuxtla Mountains). Gulf data also provide evidence that broadens our understanding of the range of responses to collapse.

4. Post-collapse responses

In keeping with efforts in archaeology to interpret collapse as a process of transformation or regeneration (Fauleit, 2015; McAnany and Yoffee, 2010; Schwartz and Nichols, 2006), we find a range of Gulf responses. Some Gulf regions reorganized with a reduced number of sites, others remained largely vacant, and some experienced highland immigration. Diverse changes include highland immigrants joining coastal settlements, highland immigrants founding new settlements, and possibly population movement within the Gulf lowlands. We focus our discussion on five localities, (1) the Actopan and Antigua-San Juan area, (2) the lower Cotaxtla and lower Papaloapan Rivers, (3) the

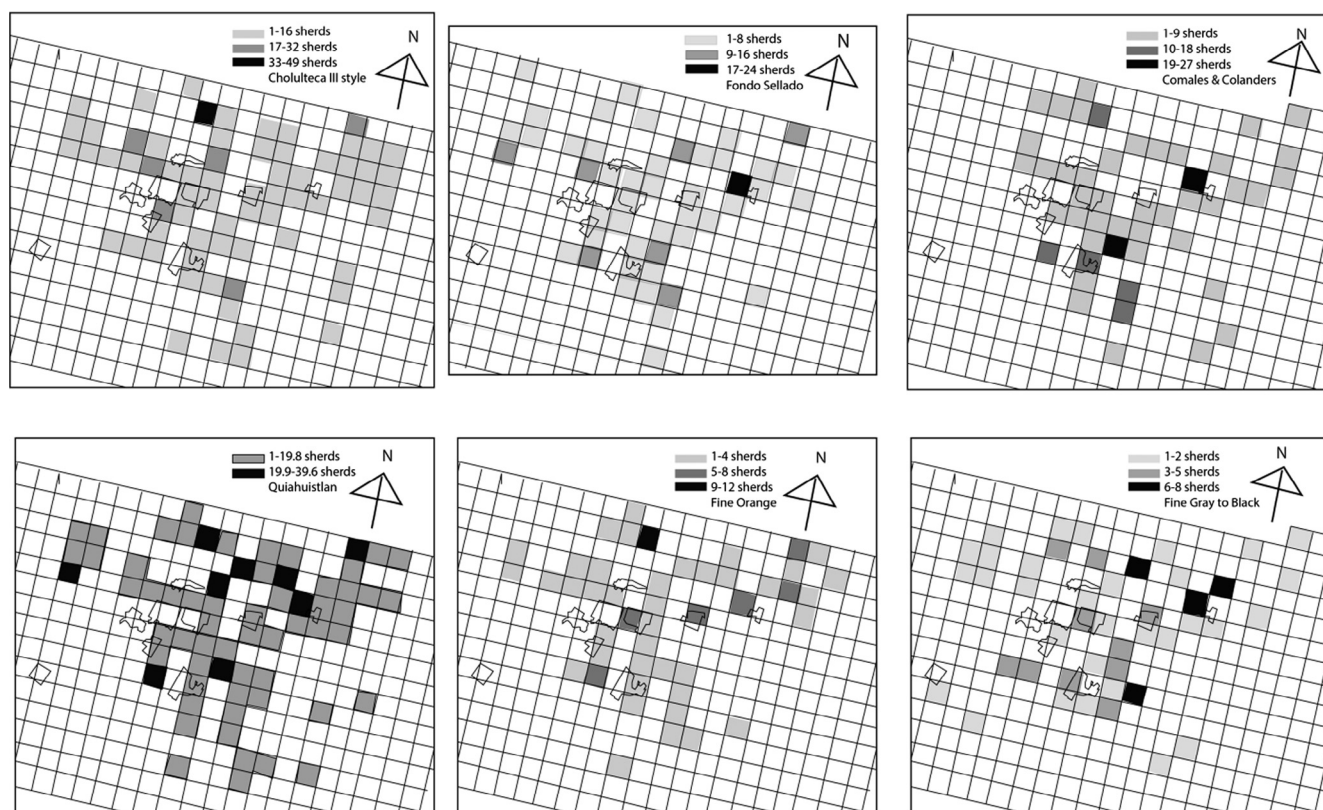


Fig. 3. Ceramic distributions at Cempoala from Brüggemann (1991:129, 132, 137–140, 144). The upper row shows three “highland” intrusive types, and the lower row shows three fine paste coastal types. Grid squares are 200 m on a side. Darker squares indicate higher counts in surface collections.

western Tuxtla Mountains, (4) southern Veracruz beyond the Tuxtlas (San Juan Evangelista and Coatzacoalcos Rivers), and (5) the western lower Grijalva River Basin in Tabasco. Despite data limitations, it seems clear that Gulf regions experienced diverse histories of collapse, as did the southern Maya lowlands (e.g., Aimers, 2007; Demarest et al., 2004; Ebert et al., 2014; Iannone, 2014b; Rice et al., 2004). In contrast, highland immigration was noteworthy in the Gulf coastal plain adjacent to the Central Highlands, but not farther eastward.

4.1. Actopan and Antigua-San Juan area

In the areas of the Actopan and Antigua-San Juan Rivers in south-central Veracruz, post-collapse includes some settlement continuity but also indications of material culture characteristic of highland areas mixed with lowland traits. Among the 23 Postclassic components detected in the NACAR 3D survey (Table 1; Heredia Barrera (2007b)), only two occur at sites lacking Classic components, indicating that continued occupation into the Postclassic is a strong possibility. Nevertheless, most of the Postclassic ceramics used for dating are part of an intrusive Mixteca-Puebla highland complex (Salazar Buenrostro and Rosiles Hernández, 2007), which points to new arrivals and substantial cultural change. Because Late Classic sites may have been re-occupied, future research will have to determine the extent to which site unit intrusion and “false regeneration” (Bronson, 2006:138) applies to these sites. Information is not available to determine the degree to which these Postclassic sites were reorganized in their layouts.

Postclassic sites are mentioned near the Actopan River (Ruiz Gordillo, 1989: 75–91). Among them, Cempoala (Fig. 1) was a regional center and subsequently a provincial Aztec administrative city that may have been reorganized or newly founded during the Postclassic period (Brüggemann, 1991; García Márquez, 2014; García Payón, 1991; Hernández Aranda, 1995; Lira López, 1991). Cempoala was a heterogeneous city that accommodated highland immigrants (Brüggemann,

1991; García Márquez, 2014). At Cempoala, despite new highland style pottery, such as comales (tortilla griddles), Black-on-red bowls, Fondo Sellado (stamped base), and Mixteca-Puebla style (Choluteca) polychromes, continuity of some traditional Gulf fine paste ceramics (Fine Gray, Fine Orange) does not suggest complete cultural disruption. Cempoala is the best studied case suggesting a mix of immigrants and continuing local inhabitants, even though controversy surrounds linguistic interpretations in relation to material culture.⁸

Ethnohistorical sources indicate expansion of Totonac speakers from sierra locations to coastal ones (Wilkerson, 1994:181), for which the extent and timing are debated or unclear. Bernal Díaz del Castillo (1963:107–110) recorded Cempoala as Totonac-speaking and an Aztec dependency. García Márquez (2014) unpacks the history of Totonac speaker attributions, including some of the contradictions encountered among historical accounts and material culture. He contends that “Totonac” was a term applied by Central Mexican inhabitants to people in an eastern geographic region with certain ritual practices and that included speakers of Totonac, Huastec, and Nahuatl. Hernández Aranda (1995) notes both Nahuatl and Totonac were spoken in various

⁸ Eminent early archaeologists in Veracruz, influenced by previous linguistic studies, assigned languages to the archaeological record, assuming that language, culture, and material culture went hand-in-hand (e.g., García Payón, 1971:540, 1991: 48–49; Medellín Zenil, 1960). Traditionally, investigators treated Cempoala as Totonac speaking. Early researchers assumed that Totonac was the language of central Veracruz, extending well south of its current concentration (García Payón, 1971:540, 1991: 48–49; Medellín Zenil, 1960)—but this idea has been challenged (Daneels, 2006b: 21–25; García Márquez, 2005:69–72). Kaufman and Justeson (2007, 2008) linked the Mixe-Sokean family to the early Isthmian script found in the lower Papaloapan Basin, the Tuxtla Mountains, and Chiapas. Although their linguistically-based decipherment has been contested (Houston and Coe, 2003), they provoked a major rethinking of the language group that may have predominated for Preclassic and Classic inhabitants in southern and south-central Veracruz. In their analysis, Huastecan and not Totonacan is the next coastal language northwest of Mixe-Sokean. For part of central Veracruz, they point out there is no a clear basis to assign the area to Huastecan versus Mixe-Sokean.

communities in the Cempoala area and north-central Veracruz.

The links between language and pottery are contentious, even though there is general agreement that migrants arrived at Cempoala and other settlements. *García Márquez* (2005:108–118) sees the Mixteca-Puebla-style ceramics as an indication of Nahuatl speakers arriving from the Puebla-Tlaxcala area, not Totonac speakers. *Brüggemann* (1991) and *Lira López* (1991) argue that Totonacs moved from Puebla and Tlaxcala onto the coast at the time that Postclassic highland-style ceramics (Mixteca-Puebla complex) appeared.⁹

Cempoala is the only Veracruz Postclassic city for which we have spatial ceramic distributions (Fig. 3). The Cempoala pottery types were grouped by *Brüggemann* (1991; *Lira López* 1991) into coastal and highland complexes and plotted in relative amounts (raw data are not available). Although *Brüggemann* saw the distribution of the two complexes as partly spatially complementary, his plots do not support spatial differentiation. To the extent the pottery groups have any identity connections, the distributions argue for a socially mixed population or perhaps broad access to pottery through marketplaces. There are indications that most of the pottery was locally made (*Noeller*, 1991), and *Hernández Aranda* (1995:100) remarks that the fancier versions of highland-style polychromes were concentrated near Walled System IV in Cempoala's nucleus, a social status consideration rather than a linguistic or ethnic one.

The language attributions obviously remain problematic. In south-central Veracruz, Mixteca-Puebla style ceramics are not argued to be related to intrusions by Totonac speakers and more likely reflect the arrival of Nahuatl speakers. Aside from the language issues at Cempoala, the mix of traditional lowland fine paste and Mixteca-Puebla-related pottery categories implies multiple cultural traditions, an important contribution to Postclassic Veracruz archaeology and an indication that settlements could be forged as a mix of immigrants. As *García Márquez* (2014) argues from a variety of evidence, Cempoala can be viewed as multi-cultural or hybrid.

4.2. Lower Cotaxtla and Papaloapan Rivers

In the lower basins of these rivers, a dense web of Classic period centers was abandoned, with indications of subsequent highland immigration that founded new settlements. Along the Lower Cotaxtla, Postclassic occupation concentrated markedly along the riverbanks (*Daneels* 1997:244–245), and substantial areas remained either sparsely settled or vacant. *Daneels* (1997: 244–250, 2016) proposed that intrusive Nahuatl groups with new material culture linked to the highlands, as discussed next, were a successive occupation (*Daneels*, 2012:463). The principal new Postclassic town was Cuertlaxtlan (Cotaxtla), which eventually headed an Aztec province, with Quauhtochco as a key upriver settlement (*García Márquez*, 2005; *Medellín Zenil*, 1952; *Ohnrsorgen*, 2001).

In the Blanco River delta on the western side of the lower Papaloapan Basin, a single Middle Postclassic site (AD 1200–1350), El Sauce, displays highland-style material culture suggesting immigration (*Ossa*, 2011; *Stark*, 2008a). Analysis of El Sauce shows the appearance of new family ritual practices (flat “cookie cutter” figurines, Texcoco Molded censers), food preparation (tortilla griddles), styles of serving dishes and utility vessels (stamp-base bowls, polychromes), and predominant obsidian sources (Pico de Orizaba and Pachuca). No specific highland ceramic complex reported in the literature exactly matched

the intrusive Sauce complex (*Curet et al.*, 1994). Rather, the intrusive enclave had elaborate decorated versions of highland-tradition Black-on-orange and Black-on-red bowls that did not fully replicate vessels elsewhere (*Curet et al.*, 1994). The new arrivals were active in elaborating status-related serving ware (*Ossa*, 2011). It may have been a situation in which people could redefine their positions in the local social and political hierarchy, similar to Spanish colonial contexts. The location of El Sauce in some of the most productive farmland in the western basin implies the occupants were free to occupy valuable real estate. Based on obsidian and ceramics, *Stark* (2008a) argued that few or no earlier local inhabitants remained in the survey area when El Sauce was founded.

A single Late Postclassic (AD 1350–1521) town, Callejón del Horno, upriver along the Blanco, has several ceramic characteristics similar to those in the Basin of Mexico (*Stark*, 2016). Another Late Postclassic settlement may have been located along the Tlalixcoyan River to the north, nearer the coast, but it has not been identified, perhaps antecedent to colonial (and modern) Tlalixcoyan (*Stark*, 1974). *Medellín Zenil* (1960: 193–194) mentions Postclassic sherds (not further specified) on the surface of a sherd dump at Late Classic Los Cerros, a center located east of Stark's Guerequito River survey and south of the Blanco. Overall, settlement remained sparse throughout the Postclassic period, and the region was probably a dependency of Cuertlaxtlan during the Aztec empire.

Other lower Papaloapan areas also had fewer Postclassic settlements compared to the Classic period. For example, in the mangrove swamp near the mouth of the Papaloapan (*Stark*, 1989 and unpublished survey data), no Postclassic settlement has been identified, but a Postclassic town at or near the colonial (and modern) town of Tlacotalpan on the Papaloapan River is likely (*Stark*, 1974). *Medellín Zenil* (1960: 190) found a few sherds of Postclassic pottery near the surface of one test pit at Cerro de las Conchas at the modern port town of Alvarado. Farther upriver along the Papaloapan we lack published archaeological surveys of sufficient extent to monitor Postclassic settlement, but a few head towns and subject villages are mentioned in early colonial accounts (*Stark*, 1974).

The eastern lower Papaloapan Basin may have had one or more settlements that included highland immigrants, akin to those along the Blanco and Cotaxtla Rivers. Mazapa, a site detected in the Tres Zapotes survey, has some highland-style Postclassic ceramics (Fondo Sellado) and architectural contrasts with Classic patterns (*Pool et al.*, 2017: 283–284). In the Cerro El Vigía survey area (*Kruszcynski*, 2001), the San Marcos site presents pottery and figurines similar to Middle Postclassic El Sauce along the Blanco River (*Stirling*, 1943:27; see also *Kruszcynski*, 2001: Fig. 6.15).¹⁰ San Marcos is the strongest possibility for a site with immigrants in view of the parallels with El Sauce ceramics.

Further complicating interpretations for the lower Papaloapan Basin is the presence of other possible Postclassic migrants. Popoloca, Mixtec, and Chinanteco speakers have been proposed as migrants to the Papaloapan region. *García Márquez* (2005: 118–120) notes sources (*Clavijero*, 1987:4; *Historia-tolteca-chichimeca*, 1989: 219, *Martínez*, 1984; *Martínez et al.*, 1984: 184) indicating that Pinomes, a Popoloca group (Otomanguan family), left areas of Puebla for south-central Veracruz. *Heredia Barrera et al.* (2007) argue for expansion of Chinanteco groups culturally (and linguistically) during the Postclassic

⁹ If Totonac speakers moved to Cempoala, whom did they encounter? For traditional Veracruz investigators like *García Payón* (1991: 48–49), they encountered coastal Totonac speakers with a different (coastal) fine paste ceramic tradition that had some continuities with Late Classic pottery. *Daneels* (2001:1018) links new decorated fine paste types such as Quiahuistlan, Tres Picos, Cerro Montoso, and Isla de Sacrificios (all uncommon farther south in south-central Veracruz) with the arrival of Totonacs on the coast during the Postclassic period. Other traditional fine paste types (Fine Orange and Fine Gray) have longer coastal records, especially in the Cotaxtla, Blanco, and Tuxtla regions.

¹⁰ In the Smithsonian National Museum collections, for complex black-on-red incised examples see <http://n2t.net/ark:/65665/3e275c33e-6ffe-4423-a4df-9a4d0b42a15d>; for Dull Buff Polychrome and Mixteca-Puebla style polychromes, see <http://n2t.net/ark:/65665/3f1c23c27-b419-405c-8f7c-b0bf321fb2df>; and for large cookie cutter style figurines see <http://n2t.net/ark:/65665/3d3de0b7e-5831-4e80-9f5b-4a20e6e20d4a>. The only Postclassic pottery recognized by *Kruszcynski* (2001:182) appears to be fragments of Texcoco Molded censers; *Kruszcynski* (2001:89–90) viewed San Marcos as Quemado phase, A.D. 600–900 and earlier). Despite *Kruszcynski* not detecting Postclassic pottery at San Marcos, the collection from *Stirling* is convincing.

period from the upper Papaloapan Basin to the lower basin on the basis of pottery, citing also Aguirre Beltrán (1992:122) and Dahlgren de Jordán (1990:68–69). The upshot of the range of linguistic contestants for the lower Papaloapan Basin is that Nahuatl is not the only possible language for people moving into what may have been multi-language communities.

In sum, the Cotaxtla and western Papaloapan lower courses have strong indications of highland immigrants, including new settlements. These regions show changes similar to those proposed by Bove et al. (2012) for the Pacific coast of Guatemala following Classic collapse. Bove et al. (2012) argued that Late Postclassic occupations reflect a new “Pipil” Nahuatl ethnicity on the basis of changes in domestic pottery, principal obsidian sources, household architecture, and site layouts. His non-fortified sites, located in some of the best Pacific coastal farmlands, suggest immigration into largely unoccupied areas.

4.3. Western Tuxtla Mountains

Venter (2016) addresses collapse and regeneration in the Tuxtla Mountains (see also Pool, 1995: 45–47). Settlement reorganization characterizes much of the western Tuxtlas following Classic collapse, although some localities seem to have been largely abandoned judging from the paucity of Postclassic sites (Table 1). In the Tepango Valley, Postclassic settlements gravitated to the south end of the valley, in contrast to the Classic period (Stoner, 2011: 294). Totogal exhibits occupation across the transition to the Postclassic and is the best-studied case of regeneration in the Tepango Valley (Venter, 2008, 2016).

There is little archaeological indication of intrusive groups arriving in the western Tuxtlas aside from two sites at the west edge of the mountains discussed in the prior section. Nevertheless, there is ethno-historic evidence from the Tuxtla *relación* of 1580 for Nahuatl speakers in the Tuxtlas, suggesting new highland arrivals (Venter, 2012; see also Umberger, 1996:159) who mainly did not display a distinct ceramic signature. The Tuxtlas Postclassic sites show a wide but sparse distribution of highland-style Texcoco Molded censer fragments (Arnold and Venter, 2004; Stoner, 2011:367–368; Venter, 2008, 2012). Exchange or emulation appear to be more promising explanations for the distribution of these ceramics (and other materials) in the Tuxtlas and elsewhere in southern Veracruz than migrants,¹¹ with some locations eventually incorporated into the Aztec empire (see Venter, 2012 for discussion of the Tuxtlas and the Aztec empire and Venter, 2016 and Venter et al., 2017 for the problem of detecting Postclassic occupation at Matacanela). Postclassic southern Veracruz presents complex possibilities for mixed communities and for social and economic relations.

4.4. San Juan Evangelista and Coatzacoalcos Rivers

These drainages raise the possibility of populations relocating within the Gulf lowlands during a long trans-regional collapse process. In both drainages, there was a period of depopulation during the Early Classic period (AD 300–600), followed by a population surge during the Villa Alta phase (AD 700–1000)—the final occupation phase of this region (Borstein, 2001; Lunagómez Reyes, 2011; Symonds et al., 2002). Villa Alta centers exhibit the distinctive Late Classic Long Plaza Plan. The late expansion in Villa Alta occupation could be due in part to population relocation from the Tuxtlas and south-central Veracruz as centers declined there. Regardless, archaeological evidence suggests depopulation occurred again. No subsequent Postclassic settlements have been identified archaeologically in survey along the Coatzacoalcos

River (Symonds et al., 2002: 134) or along the San Juan Evangelista River (Borstein, 2001).

Ethnohistorical records indicate native settlements, however. Of the more than 70 native settlements noted for the province of Coatzacoalcos, the names of 67 towns are listed in the *Espíritu Santo relación* of 1580 (Cangas y Quiñones, 1928 [1580]). This report is bolstered by earlier church records and tax assessments that document many of the same settlement names between 1550 and 1570 (Scholes and Warren, 1965:779). Although the colonial province of Coatzacoalcos extended into the modern state of Tabasco, most villages were located in southern Veracruz between the southern slopes of Sierra San Martín and the lower Coatzacoalcos River (Scholes and Warren, 1965:779). A map accompanying Melchor de Alfaro Santa Cruz's Tabasco *relación* of 1579 indicates only *Espíritu Santo* along the Coatzacoalcos River and no settlements in southern Veracruz east of that river (Scholes and Roys, 1968: 16–17).

Possibly Postclassic occupation is concentrated outside the archaeological surveys, but ceramic continuities also make it difficult to distinguish Postclassic from Villa Alta materials. On the basis of evidence at Villa del *Espíritu Santo* (Arellanos Melgarejo and Beauregard García, 2001), Daneels (2012:362) suggests the Late Classic Villa Alta settlement is inflated because some of the same wares (Fine Orange and Fine Gray) are found in Postclassic and Colonial levels. Isla Alor, Tabasco, near the border with Veracruz, also displays Postclassic Fine Orange and Fine Gray (Boxt et al., 2012). Nevertheless, even compensating for chronological mis-assignments, archaeologists are unlikely to entirely miss sizable Postclassic settlements after the Villa Alta phase in the surveyed areas; certainly more spatial coverage is needed, as can be seen in Fig. 2.

To summarize, the vigorous repopulation of the two drainages during the Villa Alta phase raises the possibility of Gulf lowland population relocations. The regions nevertheless eventually underwent a collapse and decline of population, likely with further relocations to settlements indicated ethnohistorically.

4.5. Western lower Grijalva River Basin

The western lower Grijalva Basin appears to form the eastern limit of collapse in south-central and southern Veracruz during the Postclassic period. The lower Grijalva drainage also poses issues for ceramic dating, but more detailed information is available than in southern Veracruz. Von Nagy (1997:272) notes that after a marked decline in the Early Classic period, reoccupation of the western Grijalva delta occurred during the Late Classic period (Arenal phase), a temporal pattern similar to the riverine areas of southern Veracruz. The repopulation during Arenal times, like the Villa Alta phase, could indicate relocation from other parts of the Gulf lowlands. Von Nagy (2003:869) suggests dates of ca. AD 850–1250 for the Late Arenal phase on the basis of ceramic comparisons. The subsequent Early and Late Cintla phases pertain to the remainder of the Postclassic period, contrasting with southern Veracruz, where no Postclassic phases after Villa Alta have been defined.

No dramatic change in site numbers is evident between the Arenal and Cintla phases in von Nagy's (2003: 1045, 1055, 1067) survey maps that also incorporate data from Sisson (1976), but the Arenal distributary surveyed by von Nagy does witness a drop in numbers of sites in the Cintla phases. Von Nagy emphasizes that channel shifts require consideration of geomorphological history and a very broad geographic scale to detect regional occupation patterns. Nevertheless, the Cintla Postclassic record overall may indicate less drastic declines in settlement compared to areas discussed for Veracruz. Detailed consideration of the Tabasco lowlands is outside our scope, but early colonial expeditions to the area report thriving trade near the mouth of the Grijalva at the principal town of Potonchán (Izquierdo, 1997:174; Scholes and Roys, 1968: 36–37, 58), an indication of continuing economic activities, similar to the thriving center at Cempoala—but without indications of substantial amounts of highland migrants.

¹¹ Emulation and imports are possibilities for other Postclassic artifacts: copper rings in a burial at Matacan and occasional Plumbate sherds there and elsewhere (Pool, 1995: 43); pottery in the Soncautla complex at Tres Zapotes and Isla Agaltepec (Pool, 1995); motifs on decorated vessels at Totogal and other sites (Venter, 2012); and Choluteca style polychromes in a disturbed area of the Torres site near la Venta (Drucker et al., 1959: 240–246).

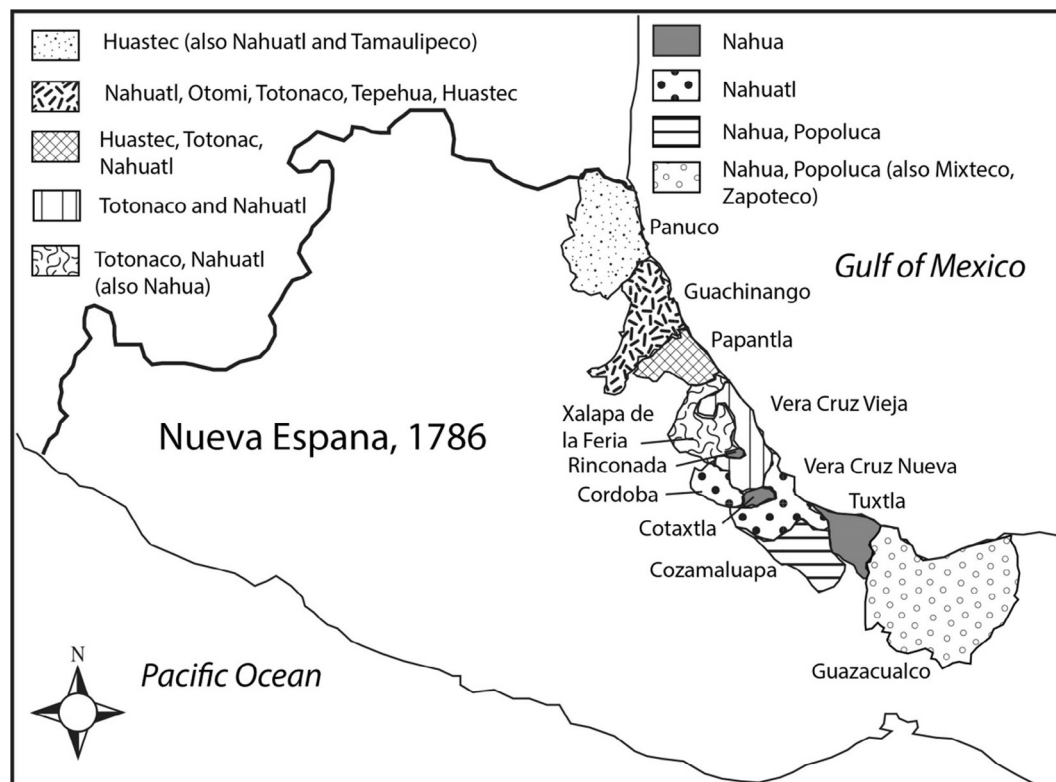


Fig. 4. Spanish contact and colonial Gulf languages organized according to 1786 political divisions (Gerhard, 1986:16, 85, 87, 89, 119, 141, 218, 221, 224, 226, 350, 369, 372, 382, 383).

4.6. Discussion of changes post-collapse

Collapse was a complex process that did not affect all areas at the same time, as indicated by the late surge of Villa Alta centers. The post-collapse record also is complex. In some areas, settlements were reorganized, but collapse created opportunities for migration to some parts of the highly productive Gulf lowlands. On the basis of contrastive environments and resources, the highland Puebla-Tlaxcala Basin and the Basin of Mexico were nearby regions with a history of exchange ties to Gulf areas. These exchange relations would have provided avenues of information flow and social contacts to facilitate migrations to vacant or under-populated lands. We need research to clarify if destabilization or other turmoil in the Puebla-Tlaxcala area provoked Postclassic migrations to the coast.

In an earlier Gulf example, Teotihuacan affiliates took advantage of vacant land from a volcanic eruption to found Classic period Matacapán in the Tuxtlas (Pool and Britt, 2000:157–158; Santley et al., 2000). In the case of Aztec Triple Alliance imperial expansion, a combination of interest in possessing reliable lowland agricultural resources and political containment of the Tlaxcalans made expansion into Veracruz attractive (García Márquez, 2005:134), including settling colonies. Aztecs resettled some people in the Gulf lowlands due to Basin of Mexico drought and starvation (summarized in Umberger, 1996). Aztec conquests in south-central Veracruz likely were successful in part because they faced lower population levels than had prevailed during the Classic period (Stark, 2017).

Collapse with depopulation makes more intelligible the process of “nahuatization” in the Gulf lowlands and elsewhere, as vacant or less densely settled lands could be claimed. Although Kaufman and Justeson (2008:62) remark on the degree of geographic stability of language groups in Mesoamerica, Nahua (Nawa) expansion is the exception. Fowler (1989:34–35) summarizes evidence from chronicler accounts about Nahua groups fleeing oppression and moving long distances into Central America. Such movements are more feasible with lower

population levels in parts of lowland Mesoamerica, leading to a mix of movements to established settlements and founding of new ones.

Gerhard’s (1986) Spanish contact and colonial information for Gulf languages reveals that many of New Spain’s civil dependencies were multilingual (Fig. 4), suggestive of migration and mixture. At the level of individual communities, as well, more than one language is often mentioned. His maps contrast with language distribution maps by earlier scholars that tended to resemble culture area maps and did not highlight mixture (Longacre, 1967; Orozco y Berra, 1954 [1880]: 116–117). Of course, colonial use of Nahuatl as a lingua franca and colonial population movements contributed to this language mix, but diversity is attested as well in very early colonial documents.

5. Concluding discussion

We have linked collapse between AD 800–1000 to later migrations into south-central Veracruz and to settlement reorganizations in southern Veracruz. A series of survey projects has proven crucial in documenting these settlement changes at a large spatial scale. We noted that the patchy paleoenvironmental data generally concur with archaeological evidence regarding Postclassic population loss. Additional paleoenvironmental studies are greatly needed, however. Even more spatially extensive coastal lowland collapse is attested by two Pacific coastal surveys.

The enlarged spatial scope of lowland collapse exposes a greater range of responses than exhibited in the southern Maya lowlands. Striking depopulation and possibly out-migration to other parts of the Gulf lowlands afforded opportunities for both new immigrants and reorganization of local populations that occurred differentially among regions. Previous research on collapse responses has produced only a few examples of in-migration (Amorites in Mesopotamia, Nichols and Weber, 2006; the Peruvian Jequetepeque Valley post-Moche, Zolber and Sutter, 2015; Nasca, Peru, post-Wari, Conlee, 2015; and possibly the Tula area in Mesoamerica, Anderson et al., 2015). We are far from

understanding whether commonalities help explain these responses. In the south-central Veracruz case, pre-existing exchange relations and proximity to the highlands were likely important, as well as the attractive agricultural resources on the coast. The roles of immigrants post-collapse and the circumstances that led to their relocation have not been highlighted in collapse studies, but they underscore Schwartz's (2006:12) comment that "it is likely that individual episodes of regeneration will be better understood within larger 'international' contexts."

Given the resource advantages of the lowlands, the collapse of strong Classic period Gulf polities seems to have been the dam that broke, allowing a variety of people speaking different languages to acquire lands or conduct trade. We consider polyethnic and multi-linguistic communities to be likely in many of the larger settlements. The links between collapse, migration, and the creation of heterogeneous communities can be seen during the Spanish Colonial period as well. By expanding the comparative frame of collapse beyond the Maya lowlands we not only contribute important insights on the diversity of responses, but we also next consider the causes of collapse.

5.1. Explaining collapse

Explaining collapse across such an extensive area is challenging. "To explain such broad patterns, we should perhaps seek equally broad explanations" (Morris, 2006:93). We briefly discuss two contributing factors that have the potential for spatially extensive impacts: (1) domino effects, and (2) climate change. As Renfrew (1979:481) noted when he adopted an abstract systems perspective, we often cannot pinpoint a specific cause of collapse. Multiple contributing factors are likely and possibly varied among regions, forming a complex subject.

A domino effect of spreading economic and political disruptions among Gulf regions is what Webster (2014:349–350) refers to as "contagion" for the late southern Maya lowland collapse (cf. discussion of the Tuxtla post-Teotihuacan by Stoner and Pool [2015] and Braswell [2015]). Domino effects open the door to consideration of varied causes of disruption that contribute to the cascade, among them population movements that could partly explain where people went. Daneels (2002:161) suggested that changes in Gulf commercial routes in the Late Classic period led to movements out of the lower Cotaxtla area to more thriving western lower Papaloapan centers astride new routes.

The surge in construction of Villa Alta centers in southern Veracruz could reflect a shift in political and economic activity even farther south-eastward, possibly attracting people from the adjacent western Tuxtla. Ethnohistorically, the lower Grijalva was a trade nexus linked to growing use of coastal water routes around the Yucatan peninsula (Scholes and Roys, 1968:3; 31–37).

Thus, domino effects have a Janus quality—disruptions or reductions in the well-being of some centers mean opportunities at others, possibly leading to population shifts. Without adequate chronological precision, these ideas remain speculative, but recognition of the large inter-regional scale of collapse is an important step toward understanding cascading changes.

Climate change, droughts in particular, can have broad effects but have been subject to much debate for the AD 800–1000 interval. Paleoenvironmental studies face many challenges: (1) differences in chronological resolution among methods (Lachniet et al., 2012), (2) differential preservation (Lamb et al., 2009), (3) regional variation due to prevailing seasonal weather (Metcalf et al., 2000), (4) volcanism (Lamb et al., 2009), and (5) confounding of anthropogenic and climate effects (Lamb et al., 2009; Metcalfe et al., 2007). Several Maya lowland and Central Mexican paleoenvironmental studies point to drought (e.g., Caballero et al., 2002; Kennett et al., 2012; Metcalfe and Davies, 2007; Smyth et al., 2017; Stahle et al., 2011), but not all (Elliott et al., 2010). Interpretation of the implications for prehispanic societies is difficult because even when droughts can be documented, local responses can

vary (e.g., Ebert et al., 2017; Iannone et al., 2014; McAnany and Gallareta Negrón, 2010; McClung de Tapia, 2012).

The Tuxtla Lake Verde core raises the possibility that while drier climatic conditions prevailed elsewhere, northerly winter storms led to wetter conditions for parts of the Gulf lowlands (Lozano-García et al., 2007, 2010). Even if the Gulf areas that collapsed bucked prevailing droughts due to northerly storms, more difficult agricultural conditions elsewhere in Mesoamerica could still have been indirectly deleterious to Gulf inhabitants. The Gulf lowlands may have experienced domino socioeconomic effects from stressed highland neighbors or lowering of river discharges from the highlands that affected Gulf farming techniques, such as recessionary plots or raised fields (Stoner, 2017). Much of the Gulf lowlands receives high enough rainfall that drought does not necessarily mean drastic crop failures. Thus, the jury is still out on whether or in what ways drought affected Gulf lowland collapse.

5.2. Future directions

Addressing the scale and diverse causes and outcomes of Gulf collapse will require balancing of continued broad assessments and more intensive site and regional studies, including more precise dating and more paleoenvironmental research. Better chronological controls will help reveal to what degree regional collapses were staggered versus more compressed in time so that we can better understand causes as well as examine possible population relocations. Radiometric and stratigraphic chronologies in the Gulf lowlands are extremely sparse compared to other key areas of Mesoamerica. An important first step is recognition of Gulf lowland collapse and its variable responses, which we have addressed here, along with related Pacific coastal patterns that include immigration. With this beachhead, investigators can better frame research questions and organize regional comparisons.

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